

**Traffic Control Standard No. 3**  
**Flashing Switch for Beacons**  
**Revised July 23, 1998**

**GENERAL:**

The flashing switch specified herein shall be designated to operate on 110-130 volt, 60 cycle, alternating current, and shall be delivered completely wired and enclosed in a weatherproof cabinet. The flasher shall meet NEMA standards for a two-circuit flasher rated at 15 amps per circuit (Type 3).

These specifications define solid-state flashers that are used to periodically interrupt a source of alternating-current line power for the purpose of providing flashing traffic signals and flashing beacons. For the purpose of these specifications, the term "solid state" shall be defined as the main current to the signal load is not switched by electro-mechanically operated contacts.

The flasher shall be certified by an independent laboratory as conforming to NEMA TS-1, Section 8, and Section 2.2.3.2. This certificate shall be included with the drawing and literature for this equipment.

**CABINET:**

Unless otherwise specified, the vendor shall furnish the controller completely housed in a weatherproof aluminum housing of clean-cut design and appearance. A hinged door shall be provided permitting complete access to the interior of the box. When closed, the door shall butt against a resilient neoprene sponge gasket to create a waterproof seal between the door and the housing. The door shall be provided with a standard lock with one key (sample key to be furnished by the department) and shall have an outside designation "Traffic Control" or "Traffic Signals" cast or embossed into the metal with letters 3/4" high or larger. The cabinet interior shall have minimum dimensions measuring 9-3/4" wide, 12" long and 5-1/2" deep.

All cabinets, unless otherwise specified, shall be suitable for wood pole mounting. The manufacturer shall drill the cabinet for two (2) 2" wire entrance holes, one (1) in the top and one (1) in the bottom, as shown in **Detail 1** 'Cabinet Wire Entrance'. The wire entrance holes shall be located on the back edge of the cabinet and centered on the width of the cabinet. When the installer attaches the hubs to the cabinet, the hub shall align on the center of the entrance hole. The vendor shall supply lock washers and hex nuts for the bolts to attach to the hub. The bolt pattern for the hub is 2-1/8" centered on a line perpendicular to the outside back of the cabinet and 3-3/4" parallel to the back of the cabinet. Mounting holes for the bolts shall be 3/8". The centers of the bolt pattern on the hub and the wire entrance hole shall coincide. The location of the hubs shall allow minimum clearance for box end wrenches to fit onto the nuts within the cabinet. The cabinet exterior shall be finished with two coats of high-grade green enamel (Outdoor Advertising Association of America No. 144). A color chip shall be available on request. Each coat shall be independently baked to resist peeling and chipping. The interior shall be furnished with gloss white enamel by the manufacturer.

**HUB, CONDUIT:**

Hubs for the cabinet shall be cast aluminum, ASTM B-108. The bolt pattern shall be as shown in **Detail 1** 'Cabinet Wire Entrance'. The blank hub shall be a flat plate, 1/4" thick. All threaded hubs shall have a threaded collar a minimum of 2" from the base of the hub. The manufacturer shall center the threaded opening within the 3 3/4" dimension of the hub and the outside edge of the threaded collar in line with the back of the hub. The manufacturer shall make all hubs with stainless steel bolts casted into the hub. The manufacturer shall design the hub with the outside smooth to shed water. On hubs with a larger threaded collar, the design shall maintain the bolting pattern.

TYPE	OPENING (S) SIZE	OPENING DESCRIPTION
blank	- 0 -	no opening, flat plate, 1/4" minimum thickness
single	3/4"	one (1) opening, 3/4" conduit thread
single	1"	one (1) opening, 1" conduit thread
single	1 1/2"	one (1) opening, 1 1/2" conduit thread
single	2"	one (1) opening, 2" conduit thread
single	2 1/2"	one (1) opening, 2 1/2" conduit thread
single	3"	one (1) opening, 3" conduit thread
Double	3/4"	two (2) openings, each 3/4" conduit thread
Double	1"	two (2) openings, each 1" conduit thread

**CABINET HUB DESCRIPTION**

Unless otherwise noted on the order, the vendor shall provide two (2) hubs for each cabinet. One (1) hub shall be a double 3/4" and the other shall be blank.

**MOUNTING ADAPTER:**

The vendor shall provide two (2) pole adapters as shown in **Detail 2** 'Pole Mounting Adapter'. The adapter shall be conformable for mounting to round poles with diameters of 4 1/2" or larger. Material for the adapter shall be aluminum alloy 6061 or 5052-H32. The minimum thickness shall be 1/8". The material shall have the mechanical strength to hold, in addition to the cabinet, the added weight and load of items such as conduit, cables, service equipment, etc. The mounting holes in the adapter shall be 5/8" and slots for steel banding shall be 1-1/8" by 1/4". The adapter shall be installed with the hubs and use the same mounting bolts of the hub. The vendor shall supply gaskets for installation between the cabinet, hub, and adapter.

**GASKET:**

The manufacturer shall cut the gasket to fit the bolt pattern specified for the hub and wire-way opening. The material for the gasket shall be 50% cork/50% neoprene material. The vendor shall send four (4) gaskets with each cabinet.

**FLASHER CHARACTERISTICS:**

Flashers shall have the following Physical Characteristics:

- A. The overall dimensions of the flasher shall not exceed 8.25 inches from the mating connector, including any handle or gripping device. The flasher shall be no more than 4.2 inches high.
- B. Intermate with a Cinch-Jones socket type S-406-SB or equivalent.
- C. Be so constructed that its lower surface will be no more than 2.1 inches below the centerline of connector configuration.
- D. Be so constructed that no part of it will extend more than 0.9 inches to the left and 1.1 inches to the right of the centerline of connector pin configuration as viewed from the front. (See Figure 8.02-1).
- E. Be so constructed that personnel inserting or removing the module will not be exposed to live parts nor be required to insert either their hands or fingers into a load rack.
- F. All printed circuit boards shall be made from NEMA (FR-4) glass-epoxy, or equivalent (See NEMA Standards Publication No. LI 1-1971). Circuit boards exceeding 2 inches in any dimension shall have a nominal thickness of at least 1/32 inches.

Note: All PC boards shall be coated with an epoxy or approved equal type material to prevent erratic performance due to high humidity, condensation, and growth of fungus and mildew. This coating will not cover the components on the board, but once the components are in place, the soldered joints shall be covered with moisture and fungus proof, clear type of acrylic lacquer. This coating shall not be injurious to the board or components and shall not interfere with the repair of the circuitry or replacement of components. The walls of all plated through holes shall have a minimum copper plating thickness of 0.001 inches. All circuit tracks shall have conductivity equivalent to at least 2 ounces per square foot of copper (2 oz/ft<sup>2</sup> Cu).

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All electrical mating surfaces shall be made of non-corrosive material. The unit shall be designed so that each component is identified by a circuit reference symbol. This identification may be affixed to the printed circuit boards, the cover of the unit, or in an assembly drawing provided with the unit.

**BACK PANEL CHARACTERISTICS:**

The manufacturer shall mount a back panel in the cabinet and shall have mounted on it cartridge type fuse, connector for NEMA Type 3 flasher, flasher support bracket, and permanently identified field terminals. The back panel size shall be 9" wide and 12" high. The manufacturer shall have the back panel constructed of 1/4" electrical grade *masonite*. The panel shall have four (4) mounting holes approximately 11/32" in diameter. The holes shall be centered on an 8" x 9" bolt pattern. The bolt pattern shall be centered on the back panel. The back panel shall support the NEMA flasher from the panel along its longest dimension. The support shall not restrict removal or installation of the flasher unit on the back panel while the panel is in the cabinet. All wiring shall be on the front of the panel. The field terminals shall have wired to it only the circuits from the field.

**ELECTRICAL CHARACTERISTICS:**

Flashers shall have the following electrical characteristics:

- A. The rating of the output circuit shall be the minimum rating for a tungsten lamp or gas-tuning-transformer load over a voltage range of 60 to 135 volts at 60 hertz. The output circuit shall not be de-rated for the operation over the ambient range of -30 degrees to +165 degrees F and the humidity range as both detailed in TS 1-2.1.05.
- B. Input to the solid-state flashers shall consist solely of the 60-hertz alternating-current power source. This input shall supply the power for the output circuit and also provide power to the flasher logic. The flasher shall turn on within 5 degrees of the zero voltage point of the alternating current line sinusoid and shall turn off within 5 degrees of the zero current point of the alternating-current line sinusoid. The flasher need not turn on within 5 degrees of the zero point of the alternating-current sinusoid for the first flash cycle (on-off cycle) after the initial application of alternating-current power to the flasher.
- C. The "flashing" voltage output shall provide not less than 50, nor more than 60, flashes per minute with an on period of 50  $\pm$  5%.
- D. The flasher output shall have a dv/dt rating of 100 volts per microsecond at 70 degrees F.

- E. The flasher output shall have a peak standoff voltage of 480 volts or greater at 70 degrees F.
- F. The output current from the flasher through the load, when the flasher is in the off state, shall not exceed a maximum of 15 milliamperes rms.
- G. The flashing output shall consist of two (2) outputs each rated at 15 amperes.
- H. Flashers shall be so designed that circuit #1 will be essentially ON when circuit #2 is OFF, and vice-versa. The principal purpose served by this arrangement is to smooth out the loading on the power source. The maximum OFF period when both circuit #1 and circuit #2 are OFF, or the maximum ON period when both circuit #1 and circuit #2 are ON, shall not exceed 17 milliseconds during the transition from OFF to ON to OFF.
- I. The line power shall be fused with NON 0-30 amp fuse. This fuse shall be sized properly for the load limit of the flasher. The wiring shall be properly sized for the design current of each circuit. Separate terminals for the line and field neutral shall be provided.
- J. Lightning protection shall be provided for line input and each signal circuit. A gas filled fuse shall be across the line input on the load side of the fuse. It shall be capable of clamping input voltage at 350 volts. A MOV shall be on each signal circuit and provide a minimum clamping voltage of 395 volts and dissipate 30 joules of energy (GE - V150LA10A or approved equal).
- K. All electrical connectors shall be insulated from the back panel at a 600 VAC rating.

**LITERATURE:**

Ten (10) sets (not to exceed one (1) set/unit) of complete literature shall be furnished with the first shipment on any order. Each set of literature must include, *at least*, the following information: Parts List, Operating Instructions, Wiring Diagrams complete with (when appropriate) waveform data, peak voltage data, and Schematic Diagrams.

